Inspection Procedure **GDF-04**

Gasoline Dispensing Facilities

PHASE II VAPOR RECOVERY TEST PROCEDURE
BOOTLESS NOZZLE PSEUDO-SPILLAGE

1. PURPOSE

1.1 The purpose of this procedure is to quantify the volume of liquid gasoline retained within the different areas of bootless nozzles and the vapor passages of the hoses between refueling events. Gasoline retained on the atmospheric side of the dispenser vapor check valve and in the nozzle's liquid path is referred to as "Pseudo-Spillage" and is subject to potential evaporation and/or spillage. The potential decrease in Phase II efficiency and the resulting Precursor Organic Compound (POC) emissions due to pseudo-spillage can be calculated based on the liquid quantities measured and volume of gasoline dispensed.

1.2 The procedure also measures the amount of gasoline dispensed if the nozzle trigger is accidentally depressed prior to activation of the dispenser. For the purpose of this procedure, this phenomenon shall be referred to as "Spitting".

2. PRINCIPLE

2.1 A gasoline-resistant graduated cylinder is used to measure the liquid gasoline retained in the nozzle/hose assembly. A piece of gasoline-resistant plastic tubing is used to sequentially isolate the primary shutoff port and vapor collection holes of the nozzle, allowing determination of the quantity of retained gasoline in the following locations:

(a) nozzle spout
(b) nozzle vapor passage
(c) nozzle primary shutoff chamber
(d) hose vapor passage

2.2 A gasoline resistant graduated cylinder is used to measure "spitting". Spitting is defined as the amount of fuel that is "dispensed" by depressing the nozzle trigger **prior** to activating the dispenser.

3. EQUIPMENT

3.1 **Port Isolation Tube**. Cut ¾ inch I.D. (Inside Diameter) gasoline-resistant flexible tubing into approximately three (3.0") inch lengths. The length of the port isolation tube shall be determined by measuring from the end of the nozzle spout to ¼ inch past the vapor collection hole(s) furthest from the end of the spout. Make a ¼ inch hole through one side of the section of tubing approximately 1 inch from the spout tip. The location of the hole shall be determined by placing the tubing on the end of the nozzle so it extends from the nozzle tip to ¼ inch past the vapor collection hole(s). Mark the location of the nozzle primary shutoff (aspirator) port and make the ¼ inch hole at this location. This hole will be used to cover or uncover the primary shutoff port of the nozzle spout during the test.

3.2 **Funnel**. Gasoline resistant, non-breakable funnel of appropriate size for use with the 0-25 ml. graduated cylinder.

3.3 **Large Graduated Cylinder**. Gasoline resistant, non-breakable 0-100 ml. graduated cylinder.

3.4 **Small Graduated Cylinder**. Gasoline resistant, non-breakable 0-25 ml. graduated cylinder.

3.5 **Gasoline Can**. Use an approved gasoline can of at least 1 gallon capacity and equipped with a vapor tight cap.

3.6 **Personal Safety Equipment**. Safety glasses and gasoline resistant gloves.

4. PROCEDURE

Note: The steps below must be followed, in the specified sequence, for each nozzle tested. Record all information on the attached field data sheet.

4.1 Baseline Run

4.1.1 Verify that the graduated cylinder is completely empty, and record initial graduated cylinder reading on the data sheet as 0.0 ml. Position the funnel on the top of the graduated cylinder. To ensure consistency between runs, take all graduated cylinder readings at the liquid level meniscus, holding the graduated cylinder at eye level.

4.1.2 Remove nozzle from dispenser holster and hold nozzle in normal upright (nozzle pointed up) position at approximately waist height.

4.1.3 Place the port isolation tube over the nozzle spout, ensuring that the vapor collection holes and primary shutoff port are completely covered and sealed.. Use care to ensure no gasoline is spilled while installing the plastic port isolation tube

4.1.4 Holding the nozzle in the normal upright position at waist height, tilt the nozzle tip down into the funnel. Maintain the nozzle at waist height until no flow (drips) of gasoline are observed for five (5) seconds. Return the nozzle to the upright position maintaining it at waist height. Record the final graduated cylinder reading on the data sheet. Calculate the volume of gasoline as the difference between the final and initial graduated cylinder readings. Do not remove the gasoline catch from the graduated cylinder. Record the volume of the gasoline catch as “SPOUT” under the BASELINE RUN section on the field data sheet.

4.1.5 With the nozzle in the normal upright position at approximately waist height, rotate the port isolation tube until the ¼ inch hole in the plastic

tubing is lined up with the nozzle spout's primary shutoff port. Ensure that the vapor collection holes are completely covered and sealed. Repeat Section 4.1.4 using the final graduated cylinder reading from Section 4.1.4 as the initial reading for this step. Calculate the volume of the gasoline catch as the difference between the final and initial graduated cylinder readings. Record the volume of the gasoline catch as "ASPIRATOR" under the BASELINE RUN section on the field data sheet.

4.1.6 **Remove the port isolation tube.** Repeat Section 4.1.4 using the final graduated cylinder reading from Section 4.1.5 as the initial reading for this step. Calculate the volume of the gasoline catch as the difference between the final and initial graduated cylinder readings. Record the volume of the gasoline catch as "NOZZLE" under the BASELINE RUN section on the field data sheet.

4.1.7 Carefully tilt the nozzle tip down into the funnel/graduated cylinder assembly. Lower the nozzle as close to the ground as possible and "walk off" the hose while keeping the nozzle tip in the funnel/graduated cylinder. Keep the nozzle lowered and hose "walked off" while any gasoline in the nozzle/hose assembly drains into the funnel/graduated cylinder. Maintain the nozzle in this position and hose "walked off" for at least fifteen (15) seconds, allowing any retained liquid in the vapor passage of the hose to drain from the vapor collection holes on the nozzle spout. After the required fifteen (15) seconds, keep the hose and nozzle in this position until there is no flow (drips) of gasoline for five (5) seconds. Remove the nozzle from the funnel/graduated cylinder and return it to the dispenser holster. Record the total graduated cylinder reading on the data sheet. Use the final graduated cylinder reading from Section 4.1.6 as the initial reading for this step. Calculate the volume of the gasoline catch as the difference between the final and initial graduated cylinder readings. Record the volume of the gasoline catch as "HOSE" under the BASELINE RUN section on the field data sheet.

4.1.8 Remove nozzle from dispenser holster and hold nozzle in normal upright (nozzle pointed up) position at approximately waist height. **Do not** use the port isolation tube. Keeping the nozzle at approximately waist height, and at arms length from your body, insert the nozzle tip at least two inches into the 0-100 ml graduated cylinder. Lower the nozzle as close to the ground as possible. With the dispenser in the **OFF** position, pull the nozzle trigger. Keep the nozzle in the graduated cylinder until there is no flow (drips) of gasoline for five (5) seconds. Remove the nozzle from the graduated cylinder and return it to the dispenser holster. On the BASELINE section of the data sheet record the number of milliliters (ml) of gasoline that "spit" into the graduated cylinder and whether or not there was tension on the trigger.

4.1.9 Empty the graduated cylinders into the approved gasoline can. Carefully empty the gasoline from the gasoline can into the LOWEST OCTANE

Phase I product riser, as necessary.

4.2 Test Run

4.2.1 Wait until a customer drives up to the pump and uses the nozzle of interest. Observe the dispensing event. If no topping off occurred, wait for 30 to 60 seconds after the nozzle has been returned to the dispenser holster at end of the refueling event. Record on the TEST RUN section of the data sheet the quantity of gasoline dispensed during the refueling event. Repeat Sections 4.1.1 through 4.1.7 and record the results on the TEST RUN section of the data sheet.

4.2.2 It is suggested nozzles found during the BASELINE RUN with large gasoline retain volumes be retested after no dispensing has occurred for at least 10 minutes. This check is useful in identifying those nozzles which may seep gasoline into the spout and vapor portions of the hose and nozzle without any dispensing activity occurring. Note on the TEST RUN section of the data sheet the test run volume of gasoline dispensed was 0.0 gallons.

5. CALCULATIONS

5.1 The mass of liquid retain in the nozzle/hose assembly shall be calculated as follows:

$$M_r = (6.2\,\text{pounds/gallon})\left(\frac{1\,\text{gallon}}{3785\,\text{mls}}\right)(V_r) \qquad \textbf{[Equation 5.1]}$$

Where:

M_r = Mass of liquid retain in nozzle/hose assembly, pounds
V_r = Volume of liquid retain in nozzle/hose assembly, ml
6.2 = Weight of gasoline, pounds/gallon
3785 = Conversion from gallons to ml, ml/gallon

5.2 The mass of vapors recovered during the refueling event, assuming a 100 percent recovery shall be calculated as follows:

$$M_{vap} = \left(\frac{8.4\,\text{pounds}}{1{,}000\,\text{gallons}}\right)(G_{dis}) \qquad \textbf{[Equation 5.2]}$$

Where:

M_{vap} = Mass of vapors recovered at 100% recovery during refueling, pounds
G_{dis} = Gallons of gasoline dispensed, gallons
8.4 = Weight of 1,000 gallons of vapors, pounds
1,000 = gallons

5.3 The potential loss in control efficiency per refueling event shall be calculated as follows:

$$E_{loss} = 100 - \left(\frac{M_{vap} - M_r}{M_{vap}}\right)(100) \qquad \textbf{[Equation 5.3]}$$

Where:

E_{loss} = The potential loss in control efficiency due to pseudo-spillage, percent

6. REPORTING

6.1 Report the total combined liquid gasoline volumes for the BASELINE and TEST RUN procedures along with the total gallons of gasoline dispensed on the data sheet.

6.2 Record the retain weight M_r, as POTENTIAL EMISSIONS on the data sheet.

6.3 Record the potential loss of control efficiency, E_{loss}, on the data sheet.

6.4 Report the “spitting” volume on the data sheet.

This Inspection Procedure developed by the Source Test Section of the
Bay Area Air Quality Management District

BOOTLESS NOZZLE PSEUDO-SPILLAGE

FIELD DATA SHEET

STATION NAME _____ ADDRESS _____

CITY _____ PHASE II SYSTEM _____

TEST CONDUCTED BY _____ TEST DATE _____ GDF # _____

Baseline Run							
Nozzle #							
Octane							
Spout, ml							
Aspirator, ml							
Nozzle, ml							
Hose, ml							
Total, ml							
Spitting, ml							
Trigger Tension	YES / NO	YES / NO	YES / NO	YES / NO	YES / NO	YES / NO	YES / NO
TEST RUN							
Gallons							
Spout, ml							
Aspirator, ml							
Nozzle, ml							
Hose, ml							
TOTAL, ml							
M_r, lbs							
M_{vap}, lbs							
E_{loss}, %							
TEST RUN							
Gallons							
Spout, ml							
Aspirator, ml							
Nozzle, ml							
Hose, ml							
TOTAL, ml							
M_r, lbs							
M_{vap}, lbs							
E_{loss}, %							